

Self-Regulating Freezable Heat Exchanger and Radiator, Phase I

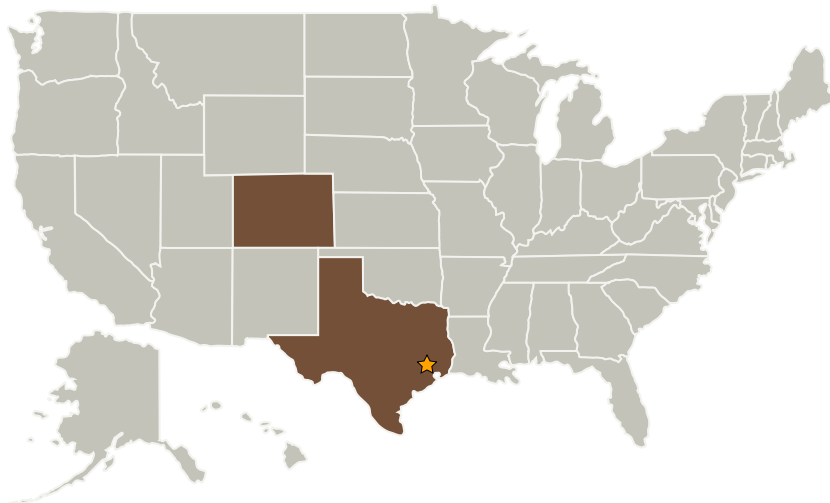
Completed Technology Project (2007 - 2008)



Project Introduction

At present, both the astronaut's metabolic heat and that produced by the Portable Life Support System are rejected to space by a sublimator that consumes up to 8 pounds of water per use; the single largest expendable during an eight-hour EVA. Unfortunately, this will not be acceptable for lunar and interplanetary missions where resupply is difficult. We can greatly reduce the water consumption by radiating most of the heat load to space. However, a radiator rejects heat at a relatively constant rate, whereas the heat generation rate depends on the workload. Without a way to match the heat removal rate, the astronaut could alternately suffer both heat exhaustion and frostbite. Therefore, TDA Research, Inc. proposes to regulate the heat rejection rate with a freezable heat exchanger. In Phase I we will conduct tests to show that the heat transfer rate can be self-regulated from high to low heat loads and vice-versa. Our research institute partner, Portland State University, will design zero-g loop heat pipes to transfer heat from the heat exchanger to the radiator. In Phase II we will design and build a full-scale freezable heat exchanger and lightweight radiator and evaluate its performance in an environmental vacuum chamber.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
TDA Research, Inc.	Supporting Organization	Industry	Wheat Ridge, Colorado

Primary U.S. Work Locations

Colorado	Texas
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Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

James Nabity

Technology Areas

Primary:

- TX14 Thermal Management Systems
 - └ TX14.2 Thermal Control Components and Systems
 - └ TX14.2.3 Heat Rejection and Storage